

DYBAL, Kazimierz; JANICKI, Jerzy; ZAK, Franciszek

New trends in the design of installations for thermal treatment of metallurgical products. Problemy proj hut maszyn 10 no.11:345-349 N '62.

1. Biprohut, Gliwice.

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

DYBAL, Kazimierz, inz.

"Design and construction of industrial furnaces" by J.H.  
Brunklaus. Reviewed by Kazimierz Dybal. Przegl mech 22 no.19:  
614 10 0 '63.

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

DYBAN, A.P.

DYBAN, A.P.; ZHURAVLEV, V.A.

Method of freeze-drying in histology. Zhur. ob. biol. 15 no.3:  
202-219 Ny-Je '54. (MLRA 7:6)

1. Kafedra gistologii i embriologii i kafedra fiziki meditsinskogo instituta, L'vov.  
(HISTOLOGY,  
\*freeze-drying, technic)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

DYBAN, A. P.

USSR/Medicine - Endocrinology

Card 1/1 Pub. 22 - 56/56

Authors : Dyban, A. P., and Demkiv, L. P.

Title : About the goitrogenic effect of rhodanine (2-thion-thiazolidine-4)

Periodical : Dok. AN SSSR 99/5, 877-880, Dec 11, 1954

Abstract : The results obtained in studying the effect of rhodanine, which appears to be 2-thion-thiazolidine-4, on the morphology of the thyroid gland are presented. It was established that the goitrogenic reaction of the thyroid gland originates as result of intensified physiological action or as result of the increased amount of hypophysin produced by the thyrotropic hormone. The observed goitrogenic effect of rhodanine confirms the general supposition that rhodanine also affects the thyrotropic function of the hypophysis. Twenty-two references: 17-USSR and 5-USA (1943-1953). Illustrations.

Institution: State Medical Institute, Lvov

Presented by: Academician A. I. Abrikosov, July 29, 1954

USSR/Human and Animal Morphology. Pathological Anatomy

8-5

Abstr Form : Prof Zhur - Biol., No 29, 1950, No 92869

Author : Dyban A.P.

Inst : -

Title : Several Questions on the Pathology of Human Embryology

Orig Pub : Akadémiai matematika, gistol. i embriologii, 1955, 32, No 4, C-18

Abstract : In humans the pathological alteration of development and death of the fetus is observed most often in the early stages of pregnancy (in the first 4-8 weeks). The so-called "desertive" and "atrophic" blastocysts are formed especially during this period; they are encountered 7-16 times more frequently than localized afflictions of the separate organs. In addition the pathological characteristics are more sharply pronounced in the fetus than in its membranes and yolk sac, and alteration arises first of all in the nerve tract, then in the heart, the vascular system, and the intestinal tract. The ectodermal sheet is preserved even in the fetus, which represents a chaotic aggregation of cells. Pathological

Card : 1/2

*Jan Histology & Embryology, Univ medical sch.*

USSR/Human and Animal Morphology. Pathological Anatomy

S-5

Abs Jour : Ref Zhur - Biol., No 20, 1958, No 92869

changes in the aborted ova are considered to be a non-specific reaction to the action of injurious factors. Histo-chemical changes in the aborted ova consist of; a decrease in RNA, DNA in the form of drops, an increase in the amount of neutral fat, and disappearance of glycogen. After injury of the fetus, amine and chorion grow and preserve tissue respiration. The villi of the chorion show increased amounts of glycogen, mucopolysaccharides, and lipids. -- P.G. Svetlov

Card : 2/2

14

Dyban, A.P.

USER/General Biology - Individual Development.

B-4

Abs Jour : Ref Thur - Biol., No 5, 1958, 19069

Author : Dyban, A.P.

Inst :

Title : Characteristics of Pathomorphological Modifications in the Early Stages of Human Fetus Formation.

Orig Pub : V sb.: Probl. sovrem. embriologii. L., Un-t, 1956, 262-267

Abstract : Generalized data obtained by the author and his collaborators on abortive fetus vesicles and the characteristics of pathomorphological modifications in the early stages of ontogenesis are investigated. The fetal sac possesses a greater resistance to various unfavorable influences by comparison with the fetus itself. Pathomorphological changes of the fetus begin a few weeks earlier than the visible manifestations of pregnancy disturbances. In early stages of development the fetuses show a primitive, non-specific morphological reaction which develops into a disorderly

Card 1/2

USSR/General Biology - Individual Development.

B-4

Abs Jour : Ref Zhur - Biol., No 5, 1958, 19069

proliferation and dystrophy of cell elements, which  
brings on fetal disintegration.

Card 2/2

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

ZHURAVLEV, V.A.; DYBAN, A.P.

Apparatus for drying frozen organs. Zhur. ob. biol. 20 no.3:  
244-248 My-Je '59. (MIHA 12:8)

1. Lvov Medical Institute.  
(DRY-FREEZING)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

DYBAN, A.P.; TURKEVICH, N.M.; SENYK, A.F.

Relation of the chemical structure of azolidine derivatives and certain related substances to their antithyroid activity. Farm. i toks. 23 no. 5:427-432 S-0 '60. (MIRA 13,12)

1. Kafedra farmatsevticheskoy khimii (zav. - prof. N.M. Turkevich) i kafedra gistolologii (zav. - dotsent A.P. Dyban) L'vovskogo meditsinskogo instituta.

(PYRROLE) (THYROID GLAND)

DYBAN, A. P., doktor med. nauk; DEMKOV, L. P., kand. med. nauk;  
AVGUSTINOVICH, M. S. (L'vov)

Changes in  $\beta$ -basophils in varying proportions of the amount of thyro-  
tropic hormone in the pituitary gland and the blood of white rats.  
Probl. endok. i gorm. no.6:33-42 '61. (MIRA 14:12)

1. Iz kafedry histologii i embriologii (zav. - dotsent A. P. Dyban)  
L'vovskogo meditsinskogo instituta (dir. - prof. L. N. Kuzmenko)

(BLOOD CELLS) (PITUITARY HORMONES)

DYBAN, A.P.

Histophysiological and experimental studies of some problems in  
human patologic embryology. Vest.AMN SSSR 17 no.11:51-60 '62.  
(MIRA 16:1)

1. Kafedra gistologii i embriologii L'vovskogo meditsinskogo  
instituta.

(EMBRYOLOGY, HUMAN)

DYBAN, A.P.; TURKEVICH, A.N.

Effect of 3-phenylrhodanine, 3-p-tolylrhodanine and rhodanine-3-benzoic acid on the estrus cycle in white rats. Farm. i toks. 26 no.2:228-233 Mr-Apr '63. (MIRA 17:8)

1. Kafedra gistologii i embriologii (zav. - prof. A.P. Dyban) i kafedra farmatsevticheskoy khimii (zav. - prof. N.M. Turkevich) L'vovskogo meditsinskogo instituta.

DYBAN, A.P.; DEMKIV, L.P.; AVGUSTINOVICH, M.S.

Inhibition of implantation (diapause) in rats kept on a deficient  
saccharose diet. Dokl. AN SSSR 149 no.6:1453-1456 Ap '63.  
(MIRA 16:7)

1. L'vovskiy gosudarstvennyy meditsinskiy institut. Predstavлено  
академиком I.I.Shmal'gauzenom.  
(Diapause) (Sucrose)

DYBAN, A.P.; AKIMOVA, I.M.; SVETLOVA, V.A.

Effect of 2,4-diamino-5-chlorophenyl-6-ethyl pyrimidine on the  
embryonal development of rats. Dokl. AN SSSP 163 no.6:1514-1517  
Ag '65. (MIRA 18:8)

1. Laboratoriya embriologii cheloveka Instituta eksperimental'noy  
meditsiny AMN SSSR. Submitted July 14, 1964.

I 33090-66

ACC NR: AP6024072

SOURCE CODE: UR/0020/66/167/001/0228/0231

AUTHOR: Dyban, A. P.; Udalova, L. D.; Akimova, I. M.29  
BORG: Institute of Experimental Medicine, AMN SSSR (Institut eksperimental'noy meditsiny AMN SSSR)TITLE: Relationship between teratogenic action and chemical structure of medicinal substances. Experiments with chloridine and bigumal.<sup>22</sup>

SOURCE: AN SSSR. Doklady, v. 167, no. 1, 1966, 228-231

TOPIC TAGS: pharmacology, rat, biologic reproduction, drug effect, biologic mutation, antipyretic, circulatory drug

ABSTRACT: Two drugs with similar antimalarial activity - chloridine [pyrimethamine] and bigumal [paludrine] - were administered to pregnant rats to determine whether teratogenic action is a specific property of certain chemical agents or whether such action may arise from injury to the embryo caused by any pharmacological substance. The metabolite formed by bigumal (diaminodihydrotriazine) in the organism has a structural resemblance to chloridine, but it differs from chloridine in having a nitrogen atom in the 5th position instead of a carbon atom. The results of the experiments showed that 77.9% of the fetuses produced by the rats given chloridine were teratic as compared with only 0.2% of the fetuses of the rates given bigumal. It follows then that the teratogenic action

Card 1/2

UDC, 615.751:616-007-053.1+591.392

0915

76 53

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ACC NR: AP6024072

of chloridrine is not due to antimalarial activity but is a side effect of the compound. The authors concluded that a pharmacological agent cannot have teratogenic action without possessing the properties of an antimetabolite, i.e., the capacity to interfere with key links in the biochemical reactions underlying embryogenesis. This paper was presented by Academician Bakuleyev on 19 April 1965. Orig. art. has: 2 figures and 1 table. [JPRS]

SUB CODE: 06 / SUBM DATE: 16Apr65 / ORIG REF: 003 / OTH REF: 005

Card 2/2 BK



SHVETS, I.T.; DYBAN, Ye.P., mladshiy nauchnyy setrudnik.

Calculation of uncooled turbine blade temperature taking into account  
vertical variation of the area of the profile section. Trudy Inst.  
teplo.URSR no.12:3-12 '55. (MLRA 9:7)

1.Deystvitel'nyy chlen AN USSR (for Shvets)  
(Blades)

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

SHVETS, I.T.; SHVETSOV, P.D., professor; DYBAN, Ye.P., mladishiy nauchnyy setrudi-nik.

Study of heat transfer around the base of moving blades in turbines.  
Trudy Inst.tepl.URSR no.12:13-20 '55. (MLRA 9:7)

1.Dayatvitel'nyy chlen AN USSR (for Shvets)  
(Heat--Transmission) (Blades)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

SHVETS, I.T.; DYBAN, Ye.P., mladshiy nauchnyy setrudnik; KONDAK, N.M., kandidat  
tekhnicheskikh nauk.

Research on contact heat exchange between parts of heat engines. Trudy  
Inst.tepl.UHSPR no.12:21-53 '55. (MLRA 9:7)

1. Deystvitel'nyy chlen AN USSR (for Shvets).  
(Heat--Transmission) (Heat engines)

"APPROVED FOR RELEASE: 08/22/2000

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APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

USSR/Fluid Mechanics

Abs Jour: Ref Zhur Mekhanika, No 3, 1957; 9104

Abstract: temperature field in the blade joint when air is blown through it. A comparison of the cooling efficiency of the method of blowing a radial stream onto the blades with that of the method in question showed that the latter is more efficient.

Card 2/2

SOV/124-57-8-9076

Translation from: Referativnyy zhurnal, Mekhanika, 1957, Nr 8, p 72 (USSR)

AUTHORS: Shvets, I. T., Dyban, Ye. P.

TITLE: Investigation of the Energy Exchange in the Mounting Clearances of Swallow-tail Mountings of Rotor Blades (Issledovaniye energeticheskogo obmena v montazhnykh zazorakh yelochnykh khrostovikov rabochikh lopatok)

PERIODICAL: Sb. tr. In-t teploenerg. AN UkrSSR, 1956, Nr 13, pp 3-19

ABSTRACT: Presentation of the results of an experimental investigation on the heat transfer and the hydraulic resistance due to the blowing of air through the clearances in the swallow-tail mountings of a turbine blade. A description of the experimental setup and of the measuring methods is provided. The authors assert the validity of the laws of Poiseuille and Blasius for the coefficient of resistance of a capillary duct for laminar and turbulent air flow regimes within them and formulate some conditions for the existence of a transitional flow regime. Empirical criterial relationships are adduced for the heat transfer under transitional flow conditions in capillary ducts (both slot-shaped and cylindrical), both with sharp and with faired inlet edges of the respective capillary ducts.

Card ~~102~~

SOV/124-57-8-9103

Translation from: Referativnyy zhurnal, Mekhanika, 1957 Nr 8, p 75 (USSR)

AUTHORS: Shvets, I. T., Dyban, Ye. P., Kendak, N. M.

TITLE: Investigation of the Cooling of Turbine Wheels by Means of Air Blown Through the Gaps in the Swallow-tail Mountings of the Blades  
(Issledovaniye okhlagdeniya diskov turbin pred koy svezdukh cherez montazhnyye zazory velochnykh plavostorikov rabochikh lopatok)

PERIODICAL: Sb. tr. In-ta teploenerg. AN UkrSSR, 1956, Nr 13, pp 20-30

ABSTRACT: An examination of the heat distribution in a turbine wheel equipped with blades when cooling air is blown through the gaps of the swallow-tail mountings. The authors solve the heat-conductivity equations and employ the well-known relationships for the heat transfer coefficients relative to the elements of the turbine wheel, and thereby determine the temperature field in the region of the swallow-tail mountings. Equations are also adduced for the temperature of the rim in the root region and for the airflow rate when the wheel is air-cooled by means of radial flow, and the effectiveness of the two methods of cooling are compared. The comparison shows that the cooling effectiveness of the method employing an air flow through the swallow-tail mounting gaps is greater than that of the radial-flow method.

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

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CIA-RDP86-00513R000411720019-6"

DYBAN, Ye.P.  
KRENNEV, O.A.; DYBAN, Ye.P.

Determination of flow temperature between heating and cooling surfaces [with summaries in Russian and English]. Dop. AN URSR no.3:269-272 '57. (MLRA 10:9)

1. Institut tsvetoenergetiki Akademii nauk URSR. Predstavлено академику Akademii nauk USSR I.T.Shvetsem.  
(Heat--Transmission)

Dyban/E.P.

AUTHOR: Shvets, I.T., Academician, Gerashchenko, O.A., Candidate of Technical Sciences and Dyban, E.P., Candidate of Technical Sciences. 96-7-4/25

TITLE: Investigation of the temperature fields in the roots of the working blades of turbines using electrical models. (Issledovaniye temperaturnykh poley v zone khvostovikov rabochikh lopatok turbin na elektricheskikh modelyakh.)

PERIODICAL: "Teploenergetika" (Thermal Power), 1957, Vol.4, №.7, pp. 20 - 26 (U.S.S.R.)

ABSTRACT: The increasingly severe working conditions in steam and particularly in gas turbines make increasing demands on the preliminary design calculations of the temperature fields in the most heavily loaded parts. Determination of the temperature fields in the region of the blade roots is particularly necessary since these govern the conditions of heat exchange between the blades and the disc or drum parts of the rotor. Most blade root designs are of symmetrical profile. Therefore, the determination of temperature fields is a two-dimensional problem. This is not strictly true insofar as transition from the blade profile proper to the root is asymmetrical and it should be justified experimentally as was done in the tests

Card 1/8

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

described here.

An equation is given for the heat conduction in rectangular co-ordinates for plane steady thermal conditions. In the particular case considered this equation can only be solved by a numerical method. An analysis was made of various methods of solving the problem and this showed that the analogue method and particularly the electro-thermal analogue method is simplest.

The general principle of the electro-thermal analogue consists of observing similarity of the following conditions in the thermal original and the electrical model: 1) geometrical similarity; 2) similarity of potentials; 3) similarity of fields of conductivity, and 4) similarity of boundary conditions. The fulfilment of these conditions is briefly discussed.

For the purpose of carrying out electro-model measurements use was made of an integrator ЭГДА-6/53, the circuit of which is given in Fig. 1. A step-down transformer with full wave rectifier gives an output

Card 2/8

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

of 28 volts, the measuring device is a decade and potentiometer which permits readings to be made with an accuracy of 0.1% of the total potential difference. The boundary conditions can be set up roughly by a potential divider with steps of 10%. Boundary potentials are set up more accurately by special dividers. The conducting medium consisted of special electrically conducted paper, different kinds of which have different conductivity. The electrical non-uniformity of paper of a given quality does not exceed 5%.

The experimental procedure is as follows: a working scale (usually of the order of 20:1) is selected from the working drawings. On the basis of experience of analogous blade roots the mean temperature of the blade and rotor is roughly estimated and the ratio of their thermal conductivities is determined so that the appropriate quality of conducting paper can be selected. The two halves of the model are then cut out of the paper and joined with an electrically

Card 3/8

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

conducting adhesive. The conductivity of gaps and the additional thermal resistance of contacting surfaces are represented by further strips of conducting paper. The model is connected to the integrator and equipotential lines are found with a probe. These lines correspond to isotherms. The thermal resistance of the root is readily determined.

The coefficient/heat transfer from the gas to the working surfaces of the blade may be determined by one of the published methods. Ten equations were compared and were found to agree within  $\pm 25\%$ . The heat that passes through the root is removed by air in contact with the lateral surfaces of the disc and so the disc may be replaced by an equivalent resistance.

The blade roots tested were typical of those used in practice including double and single mushroom-shaped (of the Kharkov Turbine Works (XTJ) design) and fir tree-shaped (of the Neva Works (Nevskogo Zavod) design) and also fir tree-shaped with free fitting blades from

Card 4/8

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

six aviation gas turbine engines of Soviet production.

In each case the total thermal resistance and the temperature field of the root was determined. In addition separate series of tests were made to elucidate the physical nature of heat exchange processes in the region of the roots. Some of the test results in the form of charts of relative equi-potential lines are given in Figs. 2, 3 and 4. In order to check the accuracy of modelling determinations were first made of the temperature fields of roots in direct thermal experiments. Fig. 2 shows dimensionless equipotential lines in the root of the working blade of a turbine together with isotherms. The thermal test results lie between the electric model results using the two limiting assumptions in preparation of the model. The tests that have been done show that for the majority of blade roots the thermal resistance on the contacting planes is very small (for circumferential speeds of the order of 300 metres/sec the thermal resistance of contact

Card 5/8

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

does not exceed  $0.0001 \text{ m}^2/\text{hr.}^\circ\text{C}/\text{kcal}$ ) and has practically no influence on the temperature distribution in the zone of the roots. This considerably simplifies the conduct of the experiments.

Until now the mechanism of heat exchange near blade roots of fir tree shape has remained unexplained. We had supposed that most of the heat is transmitted through the erection gaps. However, special tests made on the electrical model showed that when the resistance of the erection gaps was increased to infinity the temperature field was hardly changed. This showed that the main part of the heat is transmitted through the contacting surfaces and the tensile forces on the blade have no influence because with a compression of about  $40 \text{ kg/cm}^2$  (the minimum obtained in the previous work) the heat transfer coefficient at contact exceeds  $5000 \text{ kcal/m}^2\text{hrs.}^\circ\text{C}$ . This result is illustrated in Fig. 4.

Hence it may be concluded that the additional thermal resistance of fir tree-shaped blade roots is

Card 6/8

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

mainly due to increase in the length of the path through  
which heat passes and the contraction (or expansion) of  
the flow lines with sudden change in the area of the  
conductor.

The electro-modelling procedure was used to deter-  
mine the actual thermal resistance of some typical  
blade root designs and the results are given in Table 2.

It is concluded that if axial heat leakage may be  
neglected the temperature fields in the zone of the  
blade roots may be determined by means of electrical  
paper models. The method is simple and the results are  
in good agreement with those of thermal experiment. The  
procedure can also be used to study the influence of  
such factors as the rate of supply or removal of heat,  
the type of joint, or the operating conditions on the  
temperature field of the disc.

Card 7/8

When axial leakage of heat in the zone of the roots  
cannot be neglected, data obtained from an electrical  
model for the radial thermal resistance makes it

Investigation of the temperature fields in the roots  
of the working blades of turbines using electrical  
models. (Cont.)

96-7-4/25

possible to replace the region of the root joint by a  
ring of equivalent resistance and dimensions. The  
method described by Knörnschild may then be used to  
determine the temperature field of a disc of this kind.  
There are 5 figures, 2 tables and 8 references, 6 of  
which are Slavic.

ASSOCIATION: Institute of Thermal Engineering of the Ac.Sc. of the  
Ukrainian SSSR. (Institut Teploenergetiki AN USSR)

AVAILABLE:

Card 8/8

SHVETS, I.T.; [Shvets', I.T.]; DYBAN, Ye. P.

Developing methods for engineering calculations involved in the  
cooling of turbine rotors. Nauk. zap. Kyiv. un. 16 no.16:43-50  
'57. (MIRA 13:3)

(Turbines)

DYBAN, Ye P.

24(8);26(1)

PHASE I BOOK EXPLOITATION

sov/1982

Shvets, Ivan Trofimovich, and Yevgeniy Pavlovich Dyban

Opredeleniye temperaturnogo polya okhlazhdayemogo oblozhchennogo turbinnogo diska (Determining the Temperature Field of Cooled Turbine Rotors) Kiyev, Izd-vo AN USSR, 1958. 75 p. 2,000 copies printed.

Sponsoring Agency: Akademiya nauk Ukrainskoy SSR. Institut teploenergetiki.

Resp. Ed.: M.A. Kondak, Doctor of Technical Sciences; Ed. of Publishing House: I.V. Kisina; Tech. Ed.: I.D. Milekhin.

PURPOSE: This book is intended for engineers and scientific personnel concerned with turbine design and may also be of use to students of aeronautical and power engineering vuzes preparing diploma projects.

COVERAGE: The book presents the results of theoretical and experimental investigations on heat exchange and cooling of turbine rotor disks performed at the Institut teploenergetiki, AN USSR Heat-Power Engineering Institute, Academy of Sciences, Ukrainian SSR. A method of electrothermal analogy permitting a simple

Card 1/4

Determining the Temperature Field of (Cont.)

SOV/1982

and sufficiently exact solution of two-dimensional problems of heat conductivity is presented. The effects of temperature fields during initial heating on the state of stress of an intensively cooled disk are analyzed as are the bases for hydraulic calculation of cooling systems. The book contains data necessary for engineering calculations of the temperature fields of cooled turbine disks based mainly on test results obtained by the authors in the heat-engine laboratory of the Heat-Power Engineering Institute, UkrSSR. In analyzing problems connected with the determination of the temperature field of a disk cooled by a radial blower, this book uses the material from a dissertation by Candidate O.A. Gerashchenko. Candidate of Technical Sciences N.M. Kondak participated in the analysis of results of an experimental study of heat exchange in the slit channels between the blade roots, in the construction of the test setup, and in performing the tests. There are 32 references: 28 Soviet, 3 English, and 1 German.

TABLE OF CONTENTS:

Preface	3
Standard Symbols	5
Card 2/4	

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

SEVETS, Ivan Trofimovich; DIBAN, Ye.P., kand.tekhn.nauk, otv.red.;  
REMEMENIK, T.K., red.izd-va; YEFIMOVA, M.I., tekhn.red.

[Gas-turbine units] Gazoturbinnye ustanovki. Kiev, Izd-vo  
Akad.nauk Ukr.SSR, 1958. 122 p. (MIRA 12:2)  
(Gas turbines)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

DYBAN, Ye.P.

AUTHORS: Grigorenko, Ya. M. and Isakhanov, G.V. 24-2-27/28

TITLE: Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures. (Nauchnoye soveshchaniye po voprosam prochnosti elementov turbomashin pri vysokikh temperaturakh).

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, No.2, pp. 165-167 (USSR).

ABSTRACT: A scientific conference was held in Kiev between September 28 and October 2, 1957 on problems of strength of elements of turbo-machinery at elevated temperatures which was convened by the Institute of Metallo-Ceramics and Special Alloys (Institut Metallokeramiki i Spetsplavov), the Institute of Structural Mechanics (Institut Stroitel'noy Mekhaniki) and the Institute of Thermal Power (Institut Teploenergetiki Akademii Nauk Ukrainskoy SSR) of the Ac.Sc., Ukrainian SSSR. About 200 people participated representing scientific and teaching establishments and works of Moscow, Leningrad, Kiev, Kharkov, Minsk, Kuybyshev, etc. In his opening address, Corresponding Member of the Ac.Sc. Ukraine I. N. Frantsevich pointed out the importance of the problem of high temperature strength of components of turbo-machinery.

Card 1/9

24-2-27/28

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

A number of papers were read relating to the theory of heat conductivity and thermo-elasticity. In his paper "Investigation of the temperature fields in turbine rotors" Ye. P. Dyben reported on the theoretical and experimental investigations of the steady state and the non-steady state thermo-conductivity in turbine rotors of various designs including investigations on concrete specimens of rotors produced by the Kirov and Neva Works, the "Ekonomayzer" Works and others, carried out at the Institute of Thermal Power, Ukrainian Ac.Sc. In studying the temperature fields they used the method of laboratory investigation of non-steady state thermal conductivity by means of high frequency heating, the method of electro-thermal analogy by means of "ЭГД А" equipment etc. They obtained a solution of the problem of non-steady state thermal conductivity of a hollow cylinder of finite length with a relatively general law of the changes of the temperature and the heat transfer coefficients. The Institute, jointly with the Experimental Gas Turbine Construction Works, developed a method of cooling the discs by blowing cooling air through the

Card 2/9

24-2-27/28

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

assembly gaps of the tails of the rotating blades. In his paper "Investigation of the Thermal Stresses in Turbine Rotors" A. D. Kovalenko described results of investigations in the field of thermo-elasticity carried out by the Institute of Structural Mechanics, Ukrainian Ac.Sc., the Kiev State University, the Kiev Polytechnical Institute and the Institute of Thermal Power, Ukrainian Ac.Sc. In these studies the following were investigated: problem of the plane stress state of a disc of variable thickness in the case of a cyclically symmetrical temperature field, problem of complex bending of a disc in the case of an axis-symmetrical temperature field and a variable modulus of elasticity, an axis-symmetrical problem of thermo-elasticity for a thick walled cylinder for various laws of changes of the temperature and of the modulus of elasticity along the radius and along the generatrix, etc. In the investigations strain gauges were used and also electric modelling and computing mechanisms. Furthermore, a method was developed of calculating a rotor of a two-stage aviation gas turbine considering it as a non-uniformly heated and rotating

Card 3/9

24-2-27/28

Scientific conference on the strength of elements of turbo-machinery at elevated temperatures.

system in which the following elements operate jointly: discs, shells and ring-shaped rods.

In his paper "Certain Methods of Solving the Axis-Symmetrical Problem of the Theory of Elasticity Taking Into Consideration Mass Forces and the Temperature" E. S. Umanskiy elucidated an approximate method of calculation of the stress state.

The paper of V. I. Danilovskiy (Mechanics Institute, Ac.Sc. USSR) was devoted to calculating the temperature fields in thin shells.

The paper of A. I. Veinik (Power Institute, Ac.Sc. Byelorussia) was devoted to an approximate method of solving the problem of thermo-conductivity in solid bodies.

The paper "Temperature Stresses in Thin Walled Structures" by I. A. Birger and B. F. Shor dealt with the investigations carried out by TsIAM on the thermal stresses in rods, taking into consideration variable elasticity parameters and also with the stress state of thin walled naturally twisted rods which are subjected to the effect of external forces and non-uniform heating.

In the paper "Temperature Stresses in Elements of Gas Turbines Under Conditions of Non-steady State Thermal

Card 4/9

24-2-27/28

Scientific conference on the strength of elements of turbo-machinery at elevated temperatures.

Regimes" A. G. Kostyuk (MEI) considered the method of approximate solution of the problem of the non-steady state temperature field in which the component is considered as a semi-infinite body during the initial instant of heating.

In his paper "Temperature Stresses in the Runner Blades and Discs" N. N. Malinin (MVTU) described engineering methods of calculating the thermal stresses in discs with variable elasticity parameters.

The papers of Ya. S. Podstrigach (Institute of Mechanical Engineering and Automation, Ukrainian Ac.Sc., L'vov) and of L. G. Fridman (Kuybyshev) dealt with investigations of the temperature stresses in thin walled structures particularly in bodies of aviation engines.

P. S. Kuratov (TsKTI) and Ye. M. Molchanov (VTI) reported on complex investigations of the temperature fields, the stress state and the thermal fatigue of the rotors of definite turbines.

In his paper "Experimental Investigation of the Temperature Stresses in Fully Forged Rotors" G. A. Rayer reported on experimental investigations carried out at the Neva

Card 5/9

Scientific Conference on the strength of elements of turbo-<sup>24-2-27/28</sup>  
machinery at elevated temperatures.

Engineering Works imeni Lenin (Leningrad).  
The representative of the Leningrad Metal Works,  
Engineer I. N. Shibalov conveyed information on the tests  
of equipment for heating individual elements of the  
BT-25-4 turbine during starting.

The second part of the conference was devoted to  
problems of the constructional strength of elements  
on turbo-machinery at elevated temperatures.  
In his paper "Work of the Institute of Metalloceramics  
and Special Alloys, Ukrainian Ac.Sc. in the Field of  
High Temperature Strength" G. S. Pisarenko described  
certain results obtained by the team of the Strength  
Division of the Institute as regards the development of  
new methods and test equipment for studying the mechanical  
characteristics of high temperature materials at  
temperatures up to 1500°, for high temperature static  
and dynamic tests of metalloceramic materials and of  
components and also certain results of investigations  
relating to dissipation of energy in heat resistant  
materials at normal and at elevated temperatures.  
The paper of G. S. Brokhin, A. B. Platov and A.I.Baranov

Card 6/9

Scientific Conference on the strength of elements of turbo-  
machinery at elevated temperatures. 24-2-27/28

"Technique of High Temperature Tests Applied by VNIITS" and that of Ye. N. German (VIAM) "On Certain New Methods of Testing High Temperature Metalloceramic Materials" and the paper of V. Z. Tseytlin, M. A. Filatova, A.V.Ryabchenkov and A. I. Maksimov (TsNIITMASH) "Long Duration and Fatigue Strength in Air and in Gaseous Media of a Nickel-Chromium Alloy Used for Transportation (Gas) Turbines" were all devoted to the study of high temperature materials. The results of natural investigations of elements of turbo-machinery were dealt with in papers presented by the personnel of TsKTI imeni Polzunov. N. N. Kalinovskiy (NII) dealt with the results of investigation of the carrying capacity and the long duration strength of specimens of gas turbine discs of a new design and a complicated configuration under conditions similar to the operating conditions. The author described the features of the heating system and of the damping equipment which ensures the possibility of long duration tests of natural discs by means of racing at a high temperature until disruption occurs and he also considered the deformations of a disc in the case of long

Card 7/9

24-2-27/28

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

duration disruption, the character of the disruption of the projections provided for fixing the discs and the character is described of the material of the disc before and after fracture. In his paper "Fatigue Testing of Turbine Blades and Materials at Normal and at Elevated Temperatures" I. I. Papchenko (TsKTI) dealt with the method developed by TsKTI for generating blade oscillations permitting creation of loads of various magnitudes and frequencies at the natural oscillation frequencies, giving some of the results of the investigations.

In her paper "On the Evaluation of the Long Duration Strength of Components of Gas Turbines Taking Into Consideration Variable Stresses and Temperatures" Ye. I. Rusanova (NII) considered the conditions of disruption and the possibility of reducing the problem to the usually applied evaluation, assuming a constant temperature and constant stresses.

The paper of M. Yu. Bal'shin (Institute of Metallurgy, Ac.Sc. USSR imeni A. A. Baykov) was devoted to investigating the strength, the mechanism of sintering and the creep in relation to the thermal properties of

Card 8/9

24-2-27/28

Scientific Conference on the strength of elements of turbo-machinery at elevated temperatures.

the materials.

V. V. Kuleshov (VVIA imeni N. Ye. Zhukovskiy) described the application of the method of finite differences to calculating the strength and profiling of non-uniformly heated discs which operate in the elastic range, under conditions of creep and under conditions of plastic deformation.

G. Ye. Krumel' and A. G. Prokopenko (LPI and YuZhGORGRES) reported on the method of starting large thermal power equipment and V. I. Tseytlin reported "On the Selection of Optimum Tooth Dimensions".

For improving further the methods of calculation of the strength of individual elements of turbo-machinery at elevated temperatures, the members of the conference recommended that theoretical and experimental investigations should be extended on heat exchange in the components of turbines as well as on the stress state of these elements under conditions of non-steady state heat exchange.

(Note: This is a complete translation).

Card 9/9  
AVAILABLE: Library of Congress.

SHVETS, I.T.; GERASHCHENKO, O.A.; DYBAN, Ye.P.

Investigating temperature fields in the bands of turbine runners  
by electrothermal analogy. Trudy Inst. tepl. AN URSR no.14:3-19  
'58. (MIRA 12:4)

(Steam turbines) (Temperature)

Dyban, Ye. P

26(1)

PHASE I BOOK EXPLOITATION

SOV/2684

Shvets, Ivan Trofimovich, and Yevgeniy Pavlovich Dyban

Vozdushnoye okhlazhdeniye rotorov gazovykh turbin (Air Cooling of  
Gas-turbine Rotors) Kiyev, Izd-vo Kiyevskogo universiteta, 1959.  
349 p. 5,000 copies printed.

Sponsoring Agency: Kiyevskiy gosudarstvenny universitet.

Ed.: Ye. L. Orlik; Tech. Ed.: T. I. Khokhanovskaya.

PURPOSE: This book is intended for engineers and scientific  
workers in the field of steam-and gas-turbine construction.  
It may also be used by students of advanced courses related to  
this field.

COVERAGE: The book contains results of experimental and theoretical  
investigation of air cooling of gas turbines, and gives engineering  
methods of calculating the most frequently used systems of  
air cooling of gas-turbine rotors. Results of work on the de-  
termination of boundary conditions of heat transfer in bladed

Card 1/5

Air Cooling of Gas-turbine Rotors

SOV/2684

rotors and approximate solutions of the equation of heat conductivity for blades and disks are discussed. This research was conducted by the authors at the Heat Power Institute of the USSR Academy of Sciences, and at the Kiyev State University imeni T. G. Shevchenko. The authors also used results of other investigations reported in Soviet and foreign literature. Chapter One was written by Candidate of Technical Sciences G. F. Selyavin; Chapter Twelve was written by Candidate of Physical and Mathematic Sciences I. A. Motovilovets. The authors thank Engineers Ye. A. Zyukov and K. A. Bogachuk-Kozachuk. There are 140 references: 84 Soviet, 35 English, 19 German and 2 French.

## TABLE OF CONTENTS:

Preface	3
Introduction	5
SECTION I.	
Ch. 1. Influence of the Initial Temperature of the Working Medium on the Efficiency of Turbine Units	11
Card 2/5	

67815

24(8) 10,400r

SOV/143-60-1-12/21

AUTHORS: Shvets, I.T., Academician of the AS UkrSSR; Dyban,  
Ye.P., Selyavin, G.F., Stradomskiy, M.V., Candidates of Technical Sciences

TITLE: Experimental Determination of the Coefficients of  
Hydraulic Resistance for Apertures in Revolving  
Discs

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy: Energetika,  
1960, Nr 1, pp 89 - 99 (USSR)

ABSTRACT: This is a description of a series of experiments carried out on special apparatus (Figure 1) in the Thermal Power Engineering Institute AS UkrSSR to determine the influence of rotation on the hydraulic resistance of separate parts of the cooling system in gas turbine rotors. A series of formulae is used to determine coefficients; the consumption coefficient, i.e. the ratio of the actual gas rate through the aperture G to the rate with isoentropic flow  $G_0$ , is expressed by

Card 1/5

67815

SOV/143-60-1-12/21

Experimental Determination of the Coefficients of Hydraulic Resistance for Apertures in Revolving Discs

$$M = \frac{G}{G_0} \quad (1)$$

The cylindrical apertures used in the first series of experiments had sharp inlet and outlet edges, constant length of 24.15 mm and the following diameters: 4; 5.3; 6.5; 8; 10; 11.5; 13.3; 14.3; 20 and 25 mm, which corresponds to a change in the relative depth  $l/d$  from 6.04 to 0.96 and embraces the whole potential range of aperture sizes for supplying cooling air in gas turbines. The formulae for determining the coefficient of inlet and outlet resistance are

4

Card 2/5

67815

SOV/143-60-1-12/21

Experimental Determination of the Coefficients of Hydraulic Resistance for Revolving Discs

$$\zeta = \frac{1}{\rho_0} (1 + 0.32K_0 + 0.89K_0^2 + 0.037K_0^3 + 0.17K_0^4 - 0.043K_0^5 + 0.025K_0^6) \quad (12)$$

and

$$\zeta = \frac{1}{\rho_0} (1 + 0.6K + 0.081K^2 - 0.0024K^3 + 0.000016K^4) \quad (12a)$$

The parameter K characterizes change in the conditions governing the flow of the current through apertures in the disc during rotation.

$$K = \operatorname{tg} \Psi = \frac{u}{c} \quad (6)$$

Card 3/5 where u is the peripheral speed on the axis of the

67815

SOV/143-60-1-12/21

Experimental Determination of the Coefficients of Hydraulic Resistance for Apertures in Revolving Discs

apertures;  $c$  - mean outlet speed in the aperture.

$$K_o = \mu \cdot K \quad (10)$$

The authors conclude that, when the ratio of the speed of rotation to the mean outlet speed in the aperture is large ( $u/c = 2.5$  app.), the consumption coefficient for apertures with sharp inlet edges diminishes by about 6 times. When the ratio  $u/c$  is above 4 the influence of the shape of the inlet edges may be disregarded. Rounding off the outlet edges has no practical effect on conditions governing air flow through the apertures in rotating discs. The consumption coefficient for square apertures is near that for cylindrical channels (given similar hydraulic radii). The relative depth of the aperture, if the ratio is between

Card 4/5

67815

SOV/143-60-1-12/21

Experimental Determination of the Coefficients of Hydraulic Resistance for Apertures in Revolving Discs

$0.96 < \frac{1}{d} < 6.04$ , has no practical effect on the relationship of the consumption coefficient to rotation. With the aid of experimental data the authors established the empirical relationships of the consumption and hydraulic resistance coefficients to  $K$  and  $K'$  parameters. These are true for a disc rotating in a housing where the relative axial clearance between the disc and the housing is greater than 1.5. Much detailed information on the experiments is included. A correction slip at the end of the volume states that the readings along the axis of the ordinates in Figure 5 should be 0.2; 0.3; 0.4; 0.5; 0.6; 0.7. There are 5 graphs, 1 diagram, 1 set of a graph and a diagram and 2 Soviet references.

47

ASSOCIATION: Institut teploenergetiki AN USSR (Thermal Power Engineering Institute AS UkrSSR)

SUBMITTED: September 4, 1959  
Card 5/5

84164

*10.2000 2615 & 2115 only*S, 021/60/000/002/006/010  
A158/A029*11.9200*AUTHORS: Shvets', I.T.; Academician of the AS UkrSSR; Dyban, Ye.P.; Selyavin, G.F.; Stradom's'kyy, M.V.; Rudkin, S.K.; Mel'nyk, V.P.TITLE: Influence of Initial Disturbances on the Development of Turbulent Stream Conditions When Air Moves Through Tubes |

PERIODICAL: Dopovidi Akademiyi nauk Ukrayins'koyi Radyans'koyi Sotsialistichnoyi Respubliky, 1960, No. 2, pp. 173 - 176

TEXT: This paper presents the results of experiments studying the nature of velocity pulsations in a tube with various rates of artificially-created turbulences of the air stream and their effect on the hydraulic resistance. The following conclusions were drawn: allowances should be made for the initial turbulences of stream when calculating heat transfer and hydraulic resistance for a fluid moving through relatively short tubes. Effects of artificial turbulences are particularly great at the transition stage. Initial disturbances die away within relatively short length of tubes, these lengths being dependent on the magnitude of initial turbulence and the Reynolds number. Initial disturbances do effect the value of the coefficient of hydraulic resistance within the range

Card 1/2

84164

S/021/60/000/002/006/010  
A158/A029

Influence of Initial Disturbances on the Development of Turbulent Stream Conditions When Air Moves Through Tubes

of Reynolds numbers from 2,000 - 5,000; at higher values thereof their effect on the stream passing through a tube (having a length of 80 diameters) is within the limits of the measurement error. The experimental stand included a 4,000 mm long round tube having a 51 mm inner diameter. Initial disturbances were created with the help of perforated disks of 3 - 5 and 10 mm in diameter, installed in the intake tube section. Pulsations were measured and recorded by an ETA-5A (ETA-5A) electric thermoanemometer, at Reynolds numbers from 700 to 10,000. Figure 1 shows oscillograms giving the dependence of velocity pulsations in the intake area on the Reynolds numbers (disk with 3 mm perforations, coefficient of clogging  $\beta = 0.18$ ). Figure 2 gives the range of critical Reynolds numbers, Figure 3 shows the dependence of the relative axial pulsation on the coefficient of clogging. Figure 4 shows how the average relative velocity pulsations change along the length of a tube with a 10 mm perforated disk. There are 4 figures.

ASSOCIATION: Instytut teploenergetyky AN UkrSSR (Institute of Heat Power Engineering of the AS UkrSSR)

SUBMITTED: October 1, 1959

Card 2/2

S/124/62/000/006/013/023  
D234/D308

AUTHORS: Shvets', I. T., Dyban, E. P., Stradoms'kyy, M. V.  
and Selyavin, G. F.

TITLE: Determining flow rate coefficients of rotating  
channels

PERIODIC.. Referativnyy zhurnal, Mekhanika, no. 6, 1962, 34-35,  
abstract 6B209 (Zb. prats'. In-t teploenerh. AN URSR,  
1960, no. 18, 16-27)

TEXT: The paper is devoted to the description of results and an  
experimental investigation of the coefficients of flow rate and  
hydraulic resistance of rotating channels with application to  
turbines. The authors give the diagram of the experimental instal-  
lation with the apparatus, the method of data processing and the  
results of the experiments carried out by them, which show a con-  
siderable influence of the ratio of circumferential velocity of  
the channel center and the mean flow-rate velocity of gas in the  
channel on the flow rate coefficient and the resistance. Empirical

Card 1/2

Determining flow rate ...

S/124/62/000/006/013/023  
D234/D308

formulas are given for determining the flow rate coefficient and  
the coefficient of resistance. [Abstracter's note: Complete  
translation.]

Card 2/2

SHVETS, I.T. [Shvets', I.T.]; DYBAN, Ye.P. [Dyban, I.E.P.]; SELYAVIN, G.F.  
[Seliavin, H.F.]; STRADOMSKIY, M.V. [Stradoms'kyi, M.V.]; RUDKIN,  
S.K.; MEL'NIK, V.P. [Mel'nyk, V.P.]

Effect of initial disturbances on the development of turbulent flow  
of air through pipes. Zbir. prats' Inst. tepl. AN URSR no. 20:3-15  
'60. (MIRA 14:4)

(Pipe—Fluid dynamics)

83237

S/143/60/000/008/004/00  
A189/A029

10.2000

AUTHORS: Shvets, I. T., Academician of the AS UkrSSR; Dyban, Ye. P.; Selyavin, G. F.; Stradomskiy, M. V.; Candidates of Technical Sciences

TITLE: Experimental Investigation of the Influence of Initial Perturbations Upon the Development of the Turbulent-Flow Condition

PERIODICAL: Energetika, 1960, Vol. 3, No. 8, pp. 102-109.

TEXT: The paper presents the results of the investigation, carried out in 1958-1959, on the influence of initial perturbations upon the development of axial velocity pulsations in an isothermal flow and on their influence upon the value of the hydraulic resistance coefficient in short tubes. The tests were carried out in a drawn tube, 50 mm in diameter, 80 diameters long, linked through a system of dampers to a compressed air main. The axial velocity pulsations were measured by the 3TA 5A (ETA-5A) apparatus designed by the VEI im. V. I. Lenina (All-Union Institute of Power Engineering imeni V. I. Lenin). The tests indicated that the level of initial perturbances influences the development intensity of the

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Card 1/2

83237

S/143/60/000/008/004/005  
A189/A029

Experimental Investigation of the Influence of Initial Perturbations Upon  
the Development of the Turbulent-Flow Condition

turbulent flow. The higher the initial level in tubes shorter than 80 diameters, the sooner the laminar flow ends and the hydrodynamic stabilization of the flow ensues. A substantial influence of the level of initial perturbances upon the value of the hydraulic resistance coefficient was found for Reynolds numbers from 1,800 to 5,000. This influence was within the measurement errors for higher Reynolds numbers in tubes longer than 80 diameters. There are 3 sets of oscillograms, 3 graphs and 2 Soviet references.

ASSOCIATION: Kiyevskiy universitet imeni T. G. Shevchenko Institut teploenergetiki AN UkrSSR (Kiyev University imeni T. G. Shevchenko Institute of Heat Engineering of the AS UkrSSR)

SUBMITTED: March 18, 1960

Card 2/2

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

DYBAN, E. P., STRADOMSKII, M. V., EPIK, E. Y., and SHVETS, Y. T.

"Experimental investigation of Flow Turbulence on Heat Transfer  
at Air Motion in Tubes."

Report submitted for the Conference on Heat and Mass Transfer,  
Minsk, BSSR, June 1961.

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

YEREMENKO, Aleksandr Semenovna; VIROZUB, Ivan Yemel'yanovich; GOREATYY,  
Yuriy Pavlovich; MIRONENKO, Ivan Lazarevich; FELOSENKO, Anna  
Petrovna; DYBAN, Ye.P., kand. tekhn. nauk, retsenzent;  
TITOVA, N.M., red. izd-va; LIBERMAN, T.I., tekhn. red.

[Experimental investigation of the aerodynamics of axial-flow  
turbomachines] Metody eksperimental'nego issledovaniia aerodi-  
namiki osevykh turbomashin. Kiev, Izd-vo Akad. nauk USSR, 1961.  
129 p. (MIRA 15:5)

(Turbomachines--Aerodynamics)

S/021/61/000/005/012/012  
D215/D304

AUTHORS: Shvets', I.T., Member of AS UkrSSR, Dyban, Ye.P.,  
Stradoms'kyy, M.V., Rudkin, S.K., and Epik, E.Ya.

TITLE: Investigating radial components of velocity pulsation  
during the motion of air in short pipes

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Dopovidi, no. 5,  
1961, 644 - 648

TEXT: The ratio of these pulsations to mean velocity is usually  
considered as degree of turbulence (the so-called Karman number)  
where  $\sqrt{\langle w_r^2 \rangle}$  is the mean square value of the radial component of

velocity pulsation,  $w_0$  the mean velocity of streaming, with respect to the cross section of the pipe. The experiments were made on a seamless, hydraulically smooth pipe with inner diameter of 51 and length of 4000 mm. To increase initial disturbances, special turbulentizers were put before the pipe, in the form of perforated plates.

Card 1/3

8/021/61/000/005/012/012  
D215/D304

Investigating radial components ...

tes and gratings having different diameters of openings and different coefficients  $\beta$  (ratio of free passage to total area). Measurements of magnitude of the pulsations were made according to the thermoanemometric method with the aid of ETA-51 set of instruments. The sensitive element was a V-shaped pickup connected with two adjacent arms of the measuring bridge. Pulsations were measured at seven longitudinal sections of the pipe and at seven points within each section. The type of variation shown here was found to be valid for all turbulizers, without any exception, also for a stream of air in a pipe without artificial disturbances. It can be assumed that the part of the pipe where the radial component of velocity pulsation is variable, is the zone of hydrodynamical stabilization of the stream. The relative length of this zone depends on geometrical characteristics of the turbulizer. Practically only one turbulizer among those tested had corresponding zone of stabilization longer than 30 diameters. Two other turbulizers were intended for calming and are not considered. The value of Kr can be found, with possible error up to 10 %, from

Card 2/3

Investigating radial components ...

S/021/61/000/005/012/012  
D215/D304

$$K_{r_{ser}} = \frac{210}{Re^{0.5}} \quad (2)$$

( $K_{r_{ser}}$  is the mean value of  $K_r$  with respect to cross section of the pipe). The absolute value of the radial component of pulsation is

$$\sqrt{\overline{w_r^2}} = 6,45 \cdot 10^{-4} Re^{0.5}. \quad (3)$$

The attempt to find an empirical formula for the radial component of pulsation with respect to the length of stabilization zone has failed. The authors find that the determination of the radial component of pulsation alone is insufficient for the characterization of the stream in the initial zone of the pipe. There are 3 figures.

ASSOCIATION: Instytut teplodenergetyky AN URSR (Institute of Heat-power Engineering, AS UkrSSR)

SUBMITTED: February 1, 1960

Card 3/3

26.52<sup>00</sup>

25350  
S/021/61/000/007/008/011  
D205/D306

AUTHORS: Shvets', I.T., Member AS UkrSSR, Dyban, E.P.,  
Stradoms'kyy, M.V., Rudkin, S.K., and Epik, E.Ya.

TITLE: Effect of the level of initial disturbances or the  
heat exchange intensity during turbulent air flow in  
short pipes

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR, Dopovidi, no. 7,  
1961, 920 - 923

TEXT: In calculations involving short heat exchange surfaces it is  
essential to take into account the effect of the air stream initial  
turbulence on the value of heat exchange coefficients. The authors  
studied the effects of pipe lengths, stream conditions and that of  
initial disturbances level on heat exchange intensity in pipes less  
than 80 diameters long [Abstractor's note: This expression probably  
means the ratio: length/diameter]. The lower pipe partition was  
heated to 150°C by electricity. The temperature was measured by

Card 1/5 X

Effect of the level ...

25350  
S/021/61/000/007/008/011  
D205/D306

X

means of thermocouples and the air temperature with a specific device, also previously described. The criterial equation  $Nu = f(Re)$  as well as the obtained experimental data proves that the physical flow conditions along the pipe length have less effect on the Nu value than on the heat exchange coefficient (beyond the latter stabilization level). Therefore, in evaluating experimental data -- the pipe length influence on the average values of heat exchange coefficient, as well as that of the distance of the examined pipe partition from the pipe mouth, (for local data), the coefficient  $Ee$  was used, which is the ratio of Nusselt's number for the given pipe part and that for part remote from the air entrance. Investigation of heat exchange intensity with turbulent flow, without artificial turbulizers, proved that this intensity might be expressed (for pipe partitions beyond the stabilization level) by the following equation:  $Nu_p = 0.018 Re^{0.8}$ , which is in agreement with the well known generalization. During that kind of air flow, a laminar flow zone existed for the whole range of the studied Re values (up to  $Re = 5 \cdot 10^4$ ). Behind that zone a transitory zone was observed,

Card 2/2

25350

S/021/61/000/007/008/011

D205/D306

Effect of the level ...

the length of which is inversely proportional to Re values (Fig.1). This leads to corresponding changes in the local Nusselt's numbers. By graphs illustrating the changes of the coefficient Ee along the pipe length, the local Nu numbers as well as the average ones' can be calculated (as long as parameters on the tube entrance are constant). When artificial turbulence devices are used the air flow characteristics change, but the zone of initial artificial perturbations does not exceed 30 diameters of the pipe length, even for the most effective turbulizer. As a result of increased local heat exchange coefficient in the first pipe partition, their average values are increased along a large stretch of pipe length and are inversely proportional to Reynold's numbers; so the average increase of Nusselt's number with the most effective turbulizer (one opening 10 mm in diameter,  $\beta = 0.038$ ) was observed on the pipe length equalling about 600 diameters when  $Re$  was equal to  $5 \cdot 10^4$ , but on a length of 75 diameters only when  $Re = 1.5 \cdot 10^6$ . It follows that for evaluation of heat exchange data in the entrance part of a pipe heated by an air flow with natural as well as artificial turbulence it is necessary to make a correction on the pipe length:  $Ee =$

Card 3/5

X

25350

Effect of the level ...

S/021/61/000/007/008/011  
D205/D306

Nu/Nu<sub>p</sub>. There are 3 figures and 3 references: 2 Soviet-bloc and 1 non-Soviet-bloc.

ASSOCIATION: Institut teploenergetiki AN URSR (Institute of Thermo-energetics AS UkrSSR)

SUBMITTED: February 1, 1961

Card 4/5

SHVETS, I.T. [Shvets', I.T.], akademik; DYBAN, Ye.P. [Lyban, YE.P.];  
KHAVIN, V.Yu.

Experimental study of heat exchange in labyrinth packings of  
gas turbines. Dop. AN URSR no.10:1332-1336 '62.

(MIRA 18:4)

1. Institut teploenergetiki AN UkrSSR.

SHVETS, I.T. [Shvets', I.T.], akademik; DYBAN, Ye.P. [Dyban, E.P.];  
KOZACHUK-BOGACHUK, K.A. [Kozachuk-Bohachuk, O.A.]

Study of heat exchange in the flow of air in diffusers and nozzles.  
Dop. AN URSR no. 9:1203-1206 '62. (MIRA 18:4)

1. Institut teploenergetiki AN UkrSSR, 2, AN UkrSSR (for Shvets)

KOPYTOV, V.F., doktor tekhn. nauk, otv. red.; VESELOV, V.V., kand. khim. nauk, red.; YERINOV, A.Ye., kand. tekhn. nauk, red.; TISHCHENKO, A.T., kand. tekhn. nauk, red.; DASHEVSKIY, L.N., kand. tekhn. nauk, red.; CHEGLIKOV, A.T., kand. tekhn. nauk, red. SIGAL, I.Ya., kand. tekhn. nauk, red.; SEMENKOVSKAYA, P.T., kand. tekhn. nauk, red.; YEREMENKO, A.S., kand. tekhn. nauk, red.; DYBAN, Ye.P., kand. tekhn. nauk, red.; FEDOROV, V.I., kand. tekhn. nauk, red.; POL'SKIY, N.I., kand. fiz.-mat. nauk, red.

[Transactions of the Second Heat Engineering Conference of Young Research Workers] Trudy vtoroi teplotekhnicheskoi konferentsii molodykh issledovatelei. Kiev, Izd-vo AN USSR, 1963. 278 p. (MIRA 17:6)

1. Teplotekhnicheskaya konferentsiya molodykh issledovateley, 2, 1963.
2. Chlen-korrespondent AN Ukr.SSR (for Kopytov).

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

SHVETS, I.T. (Kiyev); DYBAN, Ye.P. (Kiyev)

Development and study of gas turbine air cooling systems.  
Izv. AN SSSR. Energ. i transp. no.6:747-758 N-D '63.  
(MIRA 17:1)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

SHVETS, I.T., akademik; DYBAN, Ye.P., kand.tekhn.nauk; KHAVIN, V.Yu., inzh.

Heat transfer in the labyrinth glands of turbine wheels. Energomasino-stroenie 9 no.12:8-11 D '63. (MIRA 17:1)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

TOLUBINSKIY, V.I., otv. red.; FEDOSEYEV, V.A., doktor fiz.-mat. nauk, zam. otv. red.; DORFMAN, A.Sh., kand. tekhn. nauk, red.; DUSHCHENKO, V.P., kand. fiz.-mat. nauk, red.; DYBAN, Ye.P., kand. tekhn. nauk, red.; KREMNEV, O.A., doktor tekhn. nauk, red.; NAZARCHUK, M.M., kand. tekhn. nauk, red.; ORNATSKIY, A.P., kand. tekhn. nauk, red.; PAVLOVICH, V.P., doktor tekhn. nauk, red.; SHIVETS, I.T., kand. tekhn. nauk, red.; SHCHEGOLEV, G.M., kand. tekhn. nauk, red.; SHCHERBAN', A.N., akademik, red.; SYTNIK, N.K., red.

[Thermophysics and heat engineering] Teplofizika i teplo-tehnika. Kiev, Naukova dumka, 1964. 339 p.  
(MIRA 18:1)

1. Akademiya nauk URSR, Kiev. Instytut tekhnichnoy teplofizyky.
2. Institut tekhnicheskoy teplofiziki AN Ukr.SSR, Kiev (for Dorfman, Dyban, Nazarchuk, Tolubinskiy, Shchegolev).
3. Kiyevskiy tekhnologicheskiy institut pi-shchevoy promyshlennosti (for Dushchenko, Pavlovich).
4. Kiyevskiy politekhnicheskiy institut (for Ornatskiy).

(Continued on next card)

TOLUBINSKIY, V.I.--- (continued). Card 2.

5. Odesskiy universitet (for Fedoseyev). 6. Kiyevskiy universitet (for Shvets). Akademiya nauk Ukr.SSR (for Shcherban', Shvets). 7. Chlen-korrespondent AN Ukr.SSR (for Tolubinskiy). 8. Gosudarstvennyy komitet Soveta Ministrov po koordinatsii nauchno-issledovatel'skikh rabot (for Shcherban').

L 21650-66 EWT(d)/EWT(m)/EWP(w)/EWP(f)/EPF(n)-2/EWP(v)/T-2/EWP(k)/ETC(m)-6 WN/RM  
ACC NR: AP6006138 SOURCE CODE: UR/0114/65/00/010/0022/0025

AUTHORS: Shvets, I. T. (Academician AN UkrSSR); Dyban, Ye. P. (Candidate of technical sciences); Stradomskiy, M. V. (Candidate of technical sciences); Gusak, Ya. M. (Engineer); Zatkovetskiy, G. N.; Klimenko, V. N.; Nasybullina, A. A.; Chepaskina, S. M.

ORG: none

TITLE: Development and investigation of the air cooling system for the high-pressure turbine rotor of GT-6-750 TMZ

SOURCE: Energomashinostroyeniye, no. 10, 1965, 22-25

TOPIC TAGS: turbine, turbine cooling, gas turbine, blade cooling/ GT-6-750 gas turbine

ABSTRACT: In conjunction with the development of gas turbine GT-6-750 (initial gas temperature 750C, pressure 5.6 kg/cm<sup>2</sup>), several air cooling systems for the high-pressure turbine rotor were designed and tested at the Ural Turbine Factory and Institute of Heat Physics of the AN UkrSSR (Ural'skiy turbomotornyy zavod i Institute tekhnicheskoy teplofisiki AN UkrSSR). The development of the final

Card 1/4

UDC: 621.438:62-71.001.5

L 21650-66

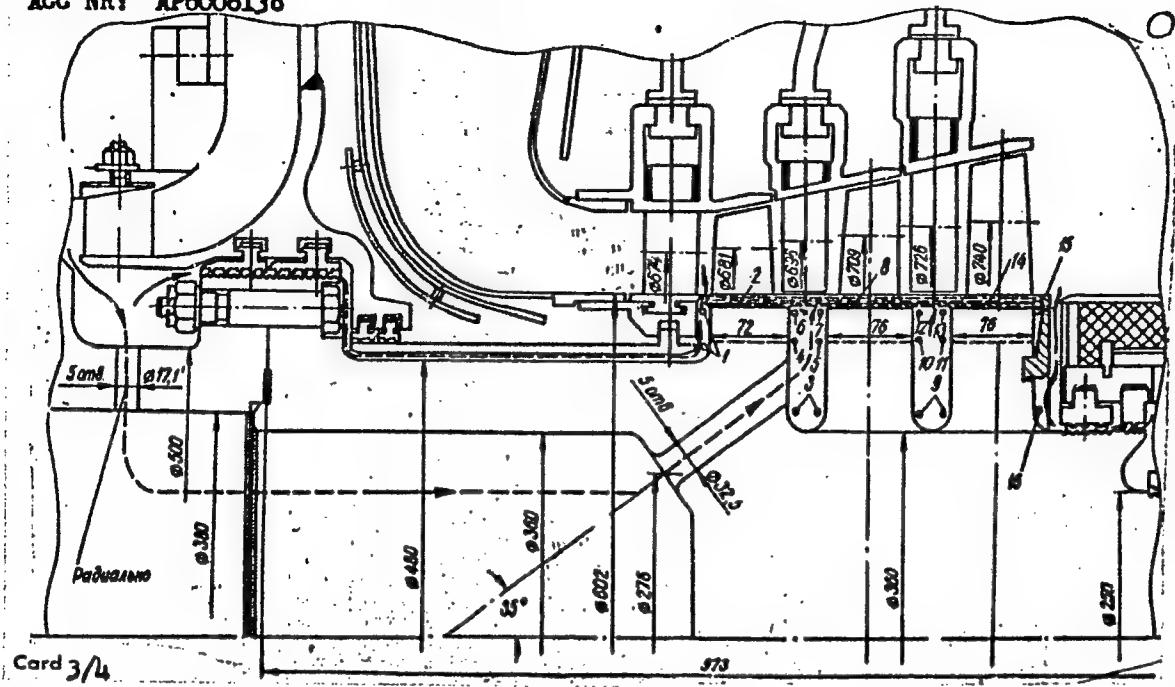
ACC NR: AP6006138

cooling system shown in Fig. 1 is discussed and the temperature distributions at the blade roots and in the turbine wheel are graphically presented for cooling air flows of 0.9 and 0.73 kg/sec respectively (0.73 kg/sec represents 1.7% of the total gas flow). The values of local cooling air pressure, temperature, flow rate, and heat transfer coefficient at the 16 locations in Fig. 1 are tabulated. It was found that the cooling system maintained all metal temperatures below 410C (at 0.73 kg/sec) and calculations show that the cooling flow can be further reduced to 0.4--0.45 kg/sec without dangerous temperatures. With such a cooling system, perlitic steels can be used with gas temperatures of up to 900C. The experiments confirmed the accuracy of previously proposed methods for calculating the cooling system parameters (Ye. P. Dyban, Isledovaniye sistem vozdukhnogo okhlazhdeniya rotorev gasovykh turbin. Avtoreferat dissertatsii. LPI im. M. I. Kalinina, 1964).

Card 2/4

L 21650-66

ACC NR: AP6006138



L 21650-66

ACC NR: AP6006138

Fig. 1. Cooling system for  
GT-6-750 gas turbine rotor.

Orig. art. has: 1 table and 4 figures.

SUB CODE: 21, 13/ SUBM DATE: none/ ORIG REF: 003

Card 4/4 *LJC*

ACCESSION NR: AP4019078

S/0170/64/000/003/0003/0009

AUTHOR: Shvets, I. T.; Dy\*ban, Ye. P.

TITLE: Heat exchange through a contact of plane metallic surfaces

SOURCE: Inzhenerno-fizicheskiy zhurnal, no. 3, 1964, 3-9

TOPIC TAGS: Heat exchange, heat transfer, metal contact, microgeometry

ABSTRACT: The laws governing contact heat transfer between two plane metallic surfaces are analyzed theoretically and the results are presented. On the basis of recent concepts of microgeometry, an attempt was made to derive an equation governing such transfer. Heat flowing through the contact may be represented as heat passing through portions of direct contact and heat passing through the interlayers between the microroughnesses and waves present on the surfaces of the two parts. The relation between the area of direct contact and the compression force is assumed to be governed by the power law, the exponent and constant coefficient of which are found from experimental data. The dependence of the direct contact area on strain is determined with the aid of the curve of a supporting

Card 1/2

ACCESSION NR: AP4019078

surface. The criterial equation obtained theoretically is in good agreement with experimental results conducted earlier and with the data of other authors. Orig. art. has 2 figures.

ASSOCIATION: Institut teploenergetiki, AN UkrSSR, Kiev (Institute of Heat and Power Engineering, AN UkrSSR)

SUBMITTED: 22Oct63

DATE ACQ: 27Mar64

ENCL: 00

SUB CODE: PH

NO REF Sov: Oll

OTHER: 003

Card 2/2

L 3464-66 EMT(m)/EMP(w)/EM(f)/EWA(d)/EMP(v)/T-2/EMP(t)/EMP(k)/EMP(z)/EMP(b)/  
ETC(m) EM/MJW/JD/AW  
ACCESSION NR: AP5024137

UR/0096/65/000/010/0047/0051 79  
621. 438. 542. 46. 001. 5 13

AUTHOR: Dyban, Ye. P. (Candidate of technical sciences); Stradomskiy, M. V.;  
Khavin, V. Yu.; Shvets, I. T. (Academician AN UkrSSR); Kurosh, V. D. (Engineer)  
TITLE: Experimental investigation of the GT-6-750 turbine cooling system

SOURCE: Teploenergetika, no. 10, 1965, 47-51

TOPIC TAGS: turbine design, hydraulics, turbine cooling, thermodynamics/  
GT-6-750 turbine

ABSTRACT: The newly developed cooling system for the rotor of a GT-6-750  
high pressure turbine was investigated. Six tests were made on the temperature  
state of the rotor and 11 on the hydraulic characteristics of the cooling system.  
Cooling system efficiency was evaluated from measurements of metal tempera-  
ture and cooling air pressure under steady state cooling conditions. Results of  
the measurements shown graphically, demonstrate that, with an overall consumpt-  
ion of cooling air of 0.86 kg/sec. and an initial gas temperature of 750C, there is  
assured a maximum temperature level not higher than 410C over the disc plates.  
This is substantially lower (by 100-110C) than the permissible value for heat  
resistant perlitic steel type EI-415. With this system, the main body of heat is  
Card 1/2

L 3464-66  
ACCESSION NR: AP5024137

6

removed from the upper part of the disc plate. Thus, heating up of the main body of the rotor proceeds very rapidly and steady state conditions are attained within 45-50 min after startup. The radial and axial temperature gradients are within permissible limits. In general, the highest temperature gradients over the thickness of a disc amount to 110C and are attained after 40 minutes from the start of heating. Orig. art. has: 5 figures

ASSOCIATION: Institut tekhnicheskoy teplofiziki AN UkrSSR (Institute of Industrial Thermophysics, AN UkrSSR); Ural'skiy turbomotornyy zavod (Ural Turbine Motor Plant)

4455

4455

SUBMITTED: 00

ENCL: 00

SUB CODE: PR

NR REF SOV: 000

OTHER: 000

Card 2/2 BP

DYBAN, Ye.P., kand.tekhn.nauk

Reply to M.I.Tsaplin's article "Calculation of the cooling of  
the disk rotors of gas turbines." Energomashinostroenie, 11  
no.2147 F '65. (MIRA 18:4)

L 29731-66 EWP(k)/EWT(m)/T-2/EWP(w)/EWP(f)/EWP(v)/EWP(t)/ETI IJP(c) EM/WW/JD  
ACC NR: AP6012267 SOURCE CODE: UR/0114/65/000/011/0013/0016

AUTHOR: Shvets, I. T. (Academician); Dyban, Ye. P. (Candidate of technical sciences); Antonenko, F. T. (Engineer); Bumarskov, A. I. (Engineer); Zerubin, L. A. (Engineer); Shpet, N. G. (Engineer)

80  
B

ORG: none

TITLE: Development and investigation of a system of air cooling of welded rotors for high power gas turbines

SOURCE: Energomashinostroyeniye, no. 11, 1965, 13-16

TOPIC TAGS: turbine rotor, gas turbine, turbine cooling, electronic simulation

ABSTRACT: In the present work, thermal calculation of the cooling system was carried out on a three-dimension electric model, based on the use of a Type EI-12 electronic integrator. A diagram shows the scheme for an electric model of a welded double-disk rotor. Based on experimental results, a figure shows the temperature field for a two-stage rotor; the data were obtained at an overall cooling air rate of 1.865 kg/sec. Conclusions are as follows: 1) use of intensive air cooling of all surfaces permits the fabrication of welded rotors with

Card 1/2

UDC: 62-71.62-253.621.438

L 29731-66

ACC NR: AP6012267

greater rigidity and less weight; 2) use of the modelling system proposed in the article permits development of more reliable and efficient systems of air cooling for two- and four-stage rotors for gas turbines; 3) parallel distribution of the cooling air over the stages allows sufficiently uniform temperature fields in all the disks; 4) with the proposed cooling system, use of more heat resistant material for the vanes of the first stage permits raising the temperature of the gas to 850-870°; and, 5) use of the electronic modelling also makes it possible, simply and with sufficient accuracy to determine the temperature field of practically any rotor, with the use of any present type of cooling system. Orig. art. has 4 figures and 1 table.

SUB CODE: 13, 09 / SUBM DATE: none/ ORIG REF: 006/ OTH REF: 001

Card 2/2 CC

DYBAN, Ye.P., kand.tekhn.nauk; STRADOMSKIY, M.V., kand. tekhn. nauk;  
SHVETS, I.T.. akademik; KNABE, A.G., inzh.; POVCLOTSKIY, L.V.,  
inzh.; SHPET, N.G., inzh.

Study of the cooling system of a seamlessly forged drum rotor of an  
experimental gas turbine. Teploenergetika 12 no.5:26-31 My '65.

(MIRA 18:5)

1. Institut tekhnicheskoy teplofiziki AN UkrSSR i Khar'kovskiy  
turbinnyy zavod imeni S.M.Kirova. 2. AN UkrSSR (forShvets).

L 26176-66 EWP(m)/EWT(1)/EWA(d)/EWA(1) OS

ACC NR: AT6008139

UR/0000/65/000/0000/0007/0017

AUTHOR: Dyban, Ye.P. (Candidate of technical sciences); Prokopov, V.G.; Stradomskiy, M.V.; Shvets, I.I. (Academician AN UkrSSR)

ORG: None;

TITLE: Problems of hydraulic resistance of air flow through porous media

SOURCE: AN UkrSSR. Techeniya zhidkostey i gazov (Flows of liquids and gases). Kiev, Naukova dumka, 1965, 7-17

TOPIC TAGS: porous metal, gas flow, hydraulic resistance, differential equation, porosity, gas viscosity, flow meter, metal powder, Reynolds number / RS-100 flow meter

ABSTRACT: This work is an experimental investigation of the air flow through porous media. The study is aimed at the determination of flow and hydraulic resistance coefficients, and their dependence upon the state of flow and the geometrical characteristics of the porous structure. A theory of similitude approach, considering the two basic physical factors, - viscosity and inertia - leads to the differential equation

$$\frac{dp}{dL} = \alpha \cdot \mu \cdot v + \beta \cdot \rho \cdot v^2 \quad (1)$$

suitable transformations and integration of (1) over the porous sample thickness gives:

$$y = \alpha \cdot \mu + \beta \cdot G_f / g \quad (2) \quad \text{where } \mu, \rho - \text{dynamic viscosity \& density of the gas and:}$$

Card 1/2

L 26476-66

ACC NR: AT6008139

5

$$y = \gamma_{av} \cdot p / (L \cdot G_f)$$

(3). In the above expressions:  $p = p_1 - p_2$  - pressure fall across sample;  $\gamma_{av}$  - average specific density of gas;  $g$  - gravity constant;  $G_f = \gamma \cdot v$  - filtration weight flow;  $v$  - velocity of gas;  $\alpha, \beta$ , - coefficients of viscosity and of inertia.

The experimental apparatus consisted of a clean and dry regulated air supply with provisions for temperature, pressure and flow measurement. Low rates of gas flow were measured by two GKF-6 gas meters and a rheometer in series; high rates - by double diaphragms and a RS-100 flow meter. Experimental samples were disks of steel powder, 5 mm thick and 50 mm dia. with porosities of 20.5, 37, 42.5 & 55.75%. All samples had particles of the same shape and granulometric distribution. The experiments confirmed the theoretical expressions. For the experimental coefficients  $\alpha$  &  $\beta$  the following expressions were derived as functions of the porosity  $P$ :

$$\alpha = 7.22 P^{-3.81} \cdot 10^{17} \text{ (m}^{-2}\text{)} \quad (4) \quad \beta = 1.26 P^{6.35} \cdot 10^{13} \text{ (m}^{-1}\text{)} \quad (5)$$

The porous medium friction coefficient,  $\lambda$ , is shown to be representable by

$$\lambda = 2 - 2/Re \quad (6) \quad \text{where } Re \text{ is the Reynold's number.}$$

Directions for further research are recommended. Orig. art. has: 5 figures, 12 formulas.

SUB CODE: 20,11 / SUBM DATE: 15May64 / ORIG REF: 001 / OTH REF: 002

Card 2/2 *Py*

L 32077-66 EWT(1)/EWT(m)/EWP(v)/T-2/EWP(t)/ETI/EWP(k) IJP(c) JD/WW/EM  
ACC NR: AP6013387 (A,N) SOURCE CODE: UR/0096/66/000/005/0019/0021

AUTHOR: Dyben, Ye. P. (Candidate of technical sciences); Stradomskiy, M. V. (Candidate of technical sciences); Klimenko, V. N. (Candidate of technical sciences); Bileka, B. D. (Engineer); Piruyeva, L. V. (Engineer)

ORG: Industrial Electric Generation Institute of the AN UkrSSR  
(Institut tekhnicheskoy teplofiksatsii AN UkrSSR--KTZ)

TITLE: Investigation of a system for cooling the rotor of a high pressure head-type gas turbine installation Model 4-750

SOURCE: Teploenergetika, no. 5, 1966, 19-24

TOPIC TAGS: gas turbine engine, combustion gas dynamics, engine cooling system, turbine compressor, turbine blade, heat resistant alloy, alloy steel / Model 4-750 gasturbine engine, ET-612K alloy steel, FI-415 alloy steel /

ABSTRACT: The 4-750 gas turbine installation is of the slotted shaft type and is designed for electric trains; at an initial gas temperature of 750°C it has a useful power of 4000 kilowatts. The experiments described in the present article were carried out on a turbo-compressor block with simulation of the low pressure section by a special throttling unit. The article shows a diagram of the experimental

Card 1/2

UDC: 621.438.542.46.001.5

L 32077-66

ACC NR: AP6013387

5

apparatus. Cooling of the rotor was done with air at an initial temperature of 200°C. The turbine blades and the rotor disks were made of heat resisting alloys of the austenitic class, the blades of alloy EI-765, and the disks of alloy EI-612K. The temperatures of the metal, the gas, and the air were measured with Chromel-Alumel thermocouples. Experimental data on the temperature fields in the rotor disks are shown in a series of curves. The scheme tested made possible a maximum disk temperature of 500°C, which allows use of a heat resisting steel of the perlite type--alloy EI-415. The consumption of cooling air was 0.82 kg/sec but its distribution over the stages required considerable temperature drops over the thickness of the disks. Orig. art. has: 6 figures and 1 table.

SUB CODE: 21// SUBM DATE: none/ ORIG REF: 004

Card 2/2 Blg

L 04270-67

ACC NR: AP6013298

SOURCE CODE: UR/0413/66/000/008/0091/0091

AUTHORS: Dyban, Ye. P.; Klimenko, V. N.; Rudkin, S. K.; Stradomskiy, M. V.; 65  
Khavin, V. Yu.; Shvets, I. T. B

ORG: none

qm

TITLE: Apparatus for measuring the temperature of revolving machine details.  
Class 42, No. 180833 Announced by Institute of Technical Thermophysics, AN UkrSSR  
(Institut tekhnicheskoy teplofiziki AN UkrSSR)

SOURCE: Izobreteniya, promyshlennyye obraztsy, tovarnyye znaki, no. 8, 1966, 91

TOPIC TAGS: temperature measurement, thermocouple, electromagnet, magnetic circuit, MEASURING INSTRUMENT, MECHANICAL STRESS

ABSTRACT: This Author Certificate presents an apparatus for measuring the temperature of revolving machine details. The apparatus contains thermocouples fixed on the revolving detail and connected into the chain of movable electromagnets of the induction-type contactless current receivers. The fixed magnets of the latter are connected into a circuit for amplifying and registration of the measured impulses (see Fig. 1). To diminish the influence of the machine shaft displacement and the interference of the nearby electromagnets, the magnetic connections of the fixed magnets are provided with magnetic screens placed on both sides of the connections in parallel to the rotation axis. The shaft carries a spline-like

Card 1/2

UDC: 536.532:621-25

L 04270-67

ACC NR: AP6013298

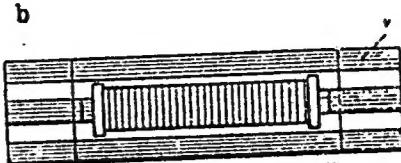
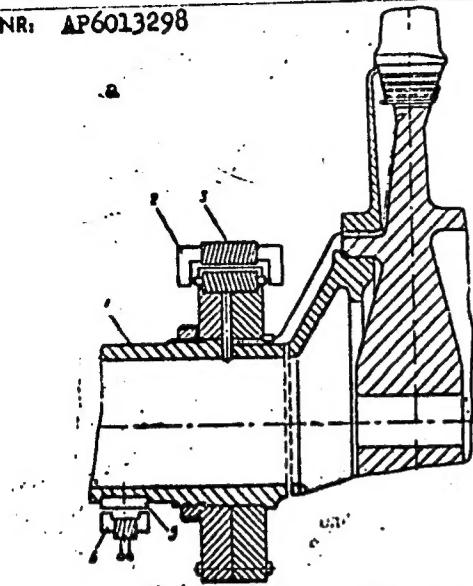


Fig. 1. 1 - machine shaft; 2 - magnetic connection; 3 - fixed electromagnets; 4 - magnetic screen; 5 - spline-like protrusion; 6 - auxiliary magnet

protrusion which, together with an auxiliary magnet, forms a system producing the directing impulses sent to the recording circuit. Orig. art. has: 1 figure.

SUB CODE: 13/ SUBM DATE: 08Feb65

Card 2/2 fv

DYBAN', Yu.P.

Determination of gas penetrability in refractory products [from  
"Archiv für das Eisenhüttenwesen," no. 10, 1960]. OGneupory  
28 no. 1:46 '63. (MIRA 16:1)  
(Refractory materials--Permeability)

"APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6

DYBAN', Yu.P.

Abstract. Ogneupory 28 no.9:430 '63.

(MIRA 16:10)

APPROVED FOR RELEASE: 08/22/2000

CIA-RDP86-00513R000411720019-6"

DYBAN', Yu.P.

Using semi-acid clays for manufacturing steel-teeming refractories. Biul. tekhn.-ekon. inform. Gos. nauch.-issl. nauch. i tekhn. inform. 17 no.9:6-8 S '64 (MIRA 18:1)